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ABSTRACT

A study was conducted to determine the feasibility of using the computer-based Synagraphic Mapping Program (SYMAP) and the Statistical Package for the Social Sciences (SPSS) in formulating an efficient and accurate information system which Creek Nation tribal staff could implement and use in planning for more effective and precise delivery of educational and social programs within the geographic confines of the Creek Nation tribal area. An empirical data base of 1,956 parental respondents was drawn in a census survey from a sampling of 1,225 Creek Indian households. Results indicated that through the development and utilization of the Tribal Educational Planning and Information System (TEPIS), tribal planning staffs can cope more effectively with such functions as: coordination of educational projects to insure that they are developed, implemented, and brought to completion; statistical and visual monitoring of educational programs; analysis and evaluation of the impact of educational projects; on-going planning of educational programs; and administration of these functions. An appendix presents the Creek Nation Census Survey Instrument with coding lists. (CMV)

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THE APPLICATION OF COMPUTER TECHNOLOGY TO THE DEVELOPMENT OF A NATIVE AMERICAN PLANNING AND INFORMATION SYSTEM

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THE APPLICATION OF COMPUTER TECHNOLOGY TO THE DEVELOPMENT OF A NATIVE AMERICAN PLANNING AND INFORMATION SYSTEM

INTRODUCTION

The educational state of Indian people in contemporary America is a matter of vital concern. With the passage of Public Law 93-638, the Indian Self-Determination and Educational Assistance Act, in January, 1975, Indian leaders and tribal officials across the country have found themselves in a position to exercise an ever-increasing amount of planning and decision making relative to social and economic programs that impact their people. Thus, the need for an understandable, effective and reliable Tribal Education Planning and Information System (hereinafter referred to as TEPIS) has been established.

STATEMENT OF THE PROBLEM

In social statistics pertaining to Indian people, the emphasis is placed on particular geographical jurisdictions of countries and states rather than treaty-delineated tribal areas. It is the state-wide incidence of Indian educational problems that receive the attention of federal and state decision-makers in allocating educational resources to tribes, not to the tribes themselves. In so doing, information that relies primarily on that produced by the United States Census Bureau, Indian educational and ethnic statistics become diluted by the sheer mass of data pertaining to the majority of jurisdictional populations (e.g., municipality, county, state).

Traditionally, the "pin map" or "dot map" has been used by tribal staff to graphically depict the spatial structure of tribal social and educational

achievement levels. Due to the amount of time involved, no systematic analysis could be performed on this data except determination of frequency distribution and ratios.

Furthermore, most unorganized quantitative data pertaining to Indian educational characteristics is difficult for tribal decision makers to understand. When tribal staff can develop unorganized educational data into a computer generated graphic and statistical planning information system, areal problems and relationships that were not understood in tabular form become more eadily recognizable. As such, more efficient and flexible data structures are then created.

There currently exist no ongoing systems within most Indian organizations which provide for computer-based processing, mapping and statistical analyses of data for tribal educational planning. This, in turn, leads to disparities in the delivery of tribal educational services due to the lack of precise information pertaining to the location, number of potential program recipients, and accurate assessment of specific educational needs of tribal members.

PURPOSE OF THE STUDY

The principal purpose of this study was to determine the feasibility of using the computer-based synagraphic mapping program (SYMAP), and the statistical package for the social sciences (SPSS) in formulating an effieient and accurate information system (TEPIC) which Creek Nation (OK) tribal staff could implement and use in planning for more effective and precise delivery of educational and social programs within the geographic confines of the Creek Nation tribal area (Figure 1).

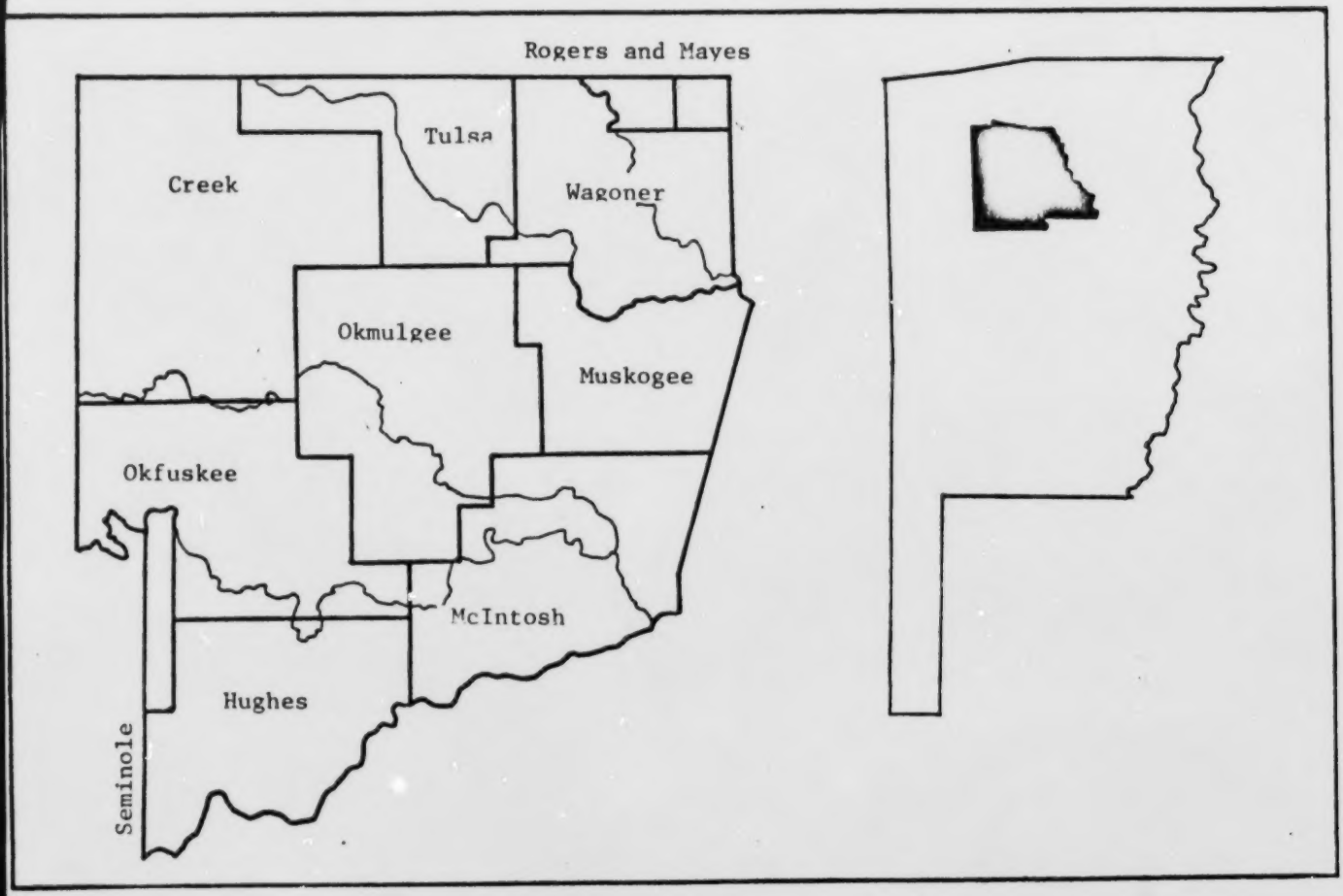

Figure 1. Creek Nation of Oklahoma Tribal Boundaries

Two variables were selected as test components in applying a computer based educational planning information system: (1) educational level (expressed in number of school years completed for both the mother and father); (2) Indian ancestry or blood level (degree of racial linkage as evidenced by amount of Indian blood of biological family), of both the mother and father. SYMAP will provide a visual comparison of density levels of parental Indian blood level and education, whereas SPSS provides a statistical analysis of the relationship. Further, TEPIS seeks to test the feasibility of applying SPSS through obtaining frequency values in a Chi-square matrix and mapping parental data values for each household using SYMAP. Thus, TEPIS is a means of presenting planning data in two complementary forms: (1) a numerical aggregated display, and (2) individual data items through geographic mapping of values for each sample household. The null hypothesis used in this test: "There is no significant difference between Indian blood level (ancestry) by education of Creek parents," focuses mainly on the statistical and spatial aspects of Creek parents and the consequences of location.

The application of TEPIS can have four important benefits for tribal planning. First, TEPIS develops a planning information system dealing specifically with tribal educational characteristics. This system would also be applicable in identifying other information needs useful in the planning of other services as indicated by various social and economic indicators relating to Indian people. For example, these indicators may include, but not be limited to, factors important to tribal social service program development such as client income, age, and occupation.

Secondly, recognizing that there may be degrees of educational disadvantage within a tribe, this educational planning system would be designed to assist

in recognizing those individuals who are most disadvantaged. Thus, a third purpose would be to develop a usable eudcation planning information system that could both quantitatively and visually identify educationally disadvantaged tribal members.

A fourth application would be to identify through the system a tribal educational problem by applying TEPIS to two variables that would serve as test components: parental Indian blood level and education. As such, the system is designed to identify tribal members who are close to Indian culture by virtue of ancestry evidenced by Indian blood level (e.g., an individual with one-half Creek blood has one parent who is a full-blood Creek and one parent who is Caucasian).

REVIEW OF LITERATURE

Major historical studies on problems of Indian education, as far back as the Meriam Report in 1929, the Senate Sub-Committee on Indian Education report "A National Tragedy - A National Challenge" in 1968, and the Havighurst study in 1969 recommended that Indian education be controlled and managed by local Indian tribal officials.

These statements and other societal movements came to a fruition in 1975 when Congress passed and the President signed Public Law 93-638, the Indian Self-Determination and Educational Assistance Act. This legislation called for local control and development of locally-designed and implemented programs for the betterment of the quality of life for Indian people. Thus, tribal officials, planners, and decision makers were faced with two basic problems:

1. Imprecise data on economic and educational variables relative to a profile of their individual tribal members, and
2. A lack of sophistication among tribal professional staffs to design, develop and implement a comprehensive planning and programming system.

It was recognized early by some tribal officials that even if precise data were available, the ability to organize it and report it in a manner in which it would be useful, understandable, and useable by tribal planners and decision makers would be impossible. Thus, a tool which would facilitate this process was deemed to be appropriate.

Computer Applications

Much of today's educational research and planning is effected with data in machine readable format on punch cards, magnetic tapes, or other such devices, with digital computers performing the numerous complex calculations upon this information.[1] Computers can also function in drawing maps on coordinate (x-y) plotters on cathode ray tubes and on ordinary line printers of digital computers.

An excellent example of the utilization of computer mapping is the program SYMAP, produced at the Laboratory of Computer Graphics and Special Analysis at Harvard University. This large FORTRAN computer (5,000 cards + program) can produce an approximation of both chloropleth and isopleth maps on the ordinary line printers of a computer while allowing the program user flexibility in input and output specifications. It is now feasible to make a map of a distribution quickly and accurately with a variety of class limits, intervals, and symbols and also with a variety of numerical trasnformations upon the data. Moreover, it is also feasible to map hypothetical distributions derived from statistical models and to map disparities (residuals) between the hypothetical and real distributions. As such, computer-produced maps serve as a logical extension and adjunct to the traditional numerical analysis presently performed on digital computers.[2]

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[1]Morton W. Scripter, "Choropleth Maps on Small Digital Computers," Proceedings of the Association of American Geographers. No. 1 (1969), pp. 133-136.

[2]James W. Carney, "Use of the SYMAP Computer Mapping Program," The Journal of Geography, Vol. 3, No. 4 (1972), pp. 167-174.

A brief scan of the literature indicated that computer graphics and specifically the use of SYMAP, while utilized extensively in geography and urban planning has not been applied much to the field of educational planning, and where SYMAP was used in general educational planning was the Los Angeles Community College data project.[3] The project resulted in computer-generated SYMAPs that combined census data associated with a geographic region with individual student data from the Los Angeles Community College. One important conclusion of the aforementioned study was that social class is an important determinant of vocational choice and curriculum orientation.

Indian Education Planning

Even though Oklahoma retains no true Indian reservations in modern times, concentrations of Indian families in Oklahoma tends to magnify their educational problems associated with poverty. Thus, by geographically identifying concentrations or members of a particular tribe, and their socio-economic characteristics, tribal planners have a reliable framework within which to direct remedial education and other associated tribal programs.

The preparation of educationally-neglected American Indians for the mainstream of community life has yet to become a major achievement of tribal governments in Oklahoma. According to tribal officials, the principal reason for this is three-fold:

A. Tribal governments in Oklahoma do not have data describing the geographical distribution and concentrations of potential and qualified recipients of their services.

B. Tribal governments generally lack necessary staff and research tools with which to engage in fundamental educational research.

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[3] A. N. Chudack and A. J. Landini, "Geosystems--A Means to Understanding Your Community." Paper presented at the California Junior College Association Research and Development Conference (Asiloma Conference Grounds, April, 1974).

C. The need for tribal staff training to use SYMAP in combination with SPSS would form a useful, economical system with which effective educational research and planning activities could be conducted by Indian people for the purpose of selecting high priority target areas and target needs for remedial and social programs.

Thus, it was felt that a dual data-treatment system such as SPSS, which would serve as an integrated system of computer programs for statistical analysis of the data, and SYMAP, which would provide the capability to map distributions in order to make evaluations and visual correlations, were the two best available tools at the time this study was undertaken.

In summary, the recommended application of both SYMAP and SPSS to the educational planning process relative to Indian education and social program delivery is essentially seen as a method to:

A. Provide background information as an aid to the development of tribal educational goals.

B. Establishing premises for educational program formulation and planning.

C. Provide in-depth analysis in order to uncover specific educational problems facing Indian planners and decision makers.

D. Provide a useful, quantitative framework for diagnosing tribal educational planning needs.

E. Search for alternative solutions relative to problems associated with the delivery of tribal educational programs.

F. Select particular solutions.

METHODOLOGY

Compiling and Refining Collected Data

The Creek Nation Census Survey instrument was formulated to facilitate automatic data processing using the IBM Model-29 keypunch machine and IBM Model 370-13 computer; because of the general availability of this equipment to tribal governments through State University Extension systems. All questions were non-attitudinal identification, of the fixed alternative type (Appendix A).[4]

Data were keypunched directly from questionnaires to IBM 80 x 80 cards. After keypunching, verification of data cards was accomplished by both the author and staff of the Oklahoma State University Computer Center.

Statistical Methodology

SPSS, like SYMAP, is accessible to a wide audience (including Creek tribal educational planners through the Oklahoma State University Extension Service) in most post-secondary education settings by extensive documentation now available from the SPSS Corporation.[5] The SPSS program was a logical choice for inclusion in TEPIS methodology due to its integrated system of computer programs designed for the analysis of social science data such as collected in the 1975 Creek Nation Census Survey (Appendix A).

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[4]Charles H. Backstrom, Survey Research (Chicago, 1963) pp. 70-84.

[5]Norman H. Nie, et. al., Statistical Package for the Social Sciences (New York, 1975).

The intent of TEPIS is to statistically and cartographically describe social reality rather than assist in the construction of broad gauge or middle-range social theory. The statistical component of TEPIS, like the cartographical component, begins with the conceptualized notion that a relationship between Indian blood level or ancestry and education of Creek parents may exist; and that this interrelationship may have a degree of causal effect, one upon the other.

To this end, an empirical data base of 1,956 parental respondents was drawn from a sampling of 1,225 Creek Indian households. Again, the selection of these two variables was based on the importance of education to Creek Nation development programs and the requirement by tribal policy, that a person need be at least one-eighth to one-fourth Indian ancestry in order to participate in tribally-financed educational programs.[6]

Cartographical Methodology: The SYMAP Program

The SYMAP program is accessible to a wide audience (including tribal planners through the Oklahoma State University Extension Service) in post-secondary education through extensive documentation now available from the Laboratory for Computer Graphics and Spatial Analysis in the Graduate School of Design, Harvard University.[7] Hardware requirements for this large 5,000 cards plus FORTRAN computer program are well within the means of most computer centers containing a medium-sized computer (for example at least 225K) and a line printer. For centers with small memory computers, educational planners

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[6]Interview with the Director Creek Nation, Division of Human Resources, 1975.

[7]James A. Dougenik and E. D. Sheehan, SYMAP User's Reference Manual (Cambridge, 1975), pp. ii-iii.

could explore the "scan line" approach developed by Scripter that uses an algorithm embodied in a FORTRAN program of 114 statements and a core space of 8K. Using card input for SYMAP, the generated map display spatially dispersed data of variable darkness.[8]

The SYMAP program was the 1963 brainchild of Howard T. Fisher, a specialist in computer applications in urban analysis at Northwestern's Technological Institute. After initial application in business and successive program refinements aided by funds from the Ford Foundation, the program became the product of Harvard's Laboratory for Computer Graphics and Spatial Analysis under the directorship of Fisher.[9]

Although three basic mapping routines are available in SYMAP, only contour was considered applicable to this study. The others (Conformant, Proximal and Trend Surface) were not considered an appropriate application due to the nature of the data (i.e., continuous versus data allocated to specific predetermined geographical boundaries).

Although TEPIS would allow tribal planners to experiment with alternative map types, the authors chose the contour map as the principal cartographical component because, in part, the output is quantitative rather than qualitative in nature. Contour maps also allow the analyst to visually group data in identifiable clusters (e.g., a contour is defined as a line connecting points of equal numeric value).

The principal advantages of the contour map are that data relating to areas can be represented without the inclusion of area boundaries (precluding time-consuming and expensive base map preparation), and that changes in variable value are shown to occur smoothly and continuously, rather than in abrupt steps.

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[8]Scripter, pp. 133-136.

[9]Dougenik and Sheehan, p. iii.

As a result, the Contour option is useful for illustrating the general trends within the distribution of the two variables under study (Indian blood level and education of Creek fathers). Thus, we used the contour map, because it seems to visually portray continuous data more effectively by connecting all data points pertaining to Creek fathers (blood and educational levels) having the same numeric value.

Tribal decision makers also opted for contour maps because, in their opinion, map simplicity allowed for ease of interpretation. For generating the various contour maps used in this study, the A-Outline, B-Data Points, E-Values, and F-Map data packages were used.[10]

In past years, Creek planners have used tabular data and a dot map to visually display where tribal members lived who may be eligible for participation in Creek sponsored educational programs. Since Creek parents with varying degrees of Indian ancestry (i.e., blood level) and education are widely distributed over several thousand square miles of the Creek Nation, the first requirement of TEPIS was to produce accurate visual displays of the tribal service area depicting parent blood levels and education.

To meet visual information needs--identifying potential client concentrations, by Indian ancestry and education--called for the development of eight SYMAPs of Creek parental education and Indian blood levels for both the northern and southern regions of the Creek Nation. The study area was divided into two regions because of program limitations to 1,000 data points. The northern area contains 822 data points with the southern area containing over 400; thus, necessitating the division into two regions. The following four steps reflect a summary of procedures in establishing complete card decks preparatory to producing computer maps of the study area.

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[10]Interview with the Director, Creek Nation Department of Human Resources.

Step 1. The A-Outline package of SYMAP calls for the definition of the study area or map area in which data values will be displayed and interpolation takes place. In this study, the author obtained a large topographical map of the tribal area. Using a grid reference clock-wise direction for the outline of the tribal area noting where the outline changed directions.[11]

Step 2. B-Data points are required for contour maps to specify the locations with data values. For this study, it was decided that interview rather than street addresses or counties would serve as appropriate geographical identifiers inasmuch as they more precisely defined sample location. Furthermore, the actual interview site was easy to obtain without extensive recording required by other geographical units. Next, the appropriate center for each interview was determined and the X and Y coordinates plotted using the grid reference sheet.

Step 3. The E-Value package of SYMAP associates data values with each data point. Data relating to Creek father-Indian blood level and education was taken from each questionnaire and transferred by computer to IBM 80 X 80 cards.

Step 4. In the SYMAP program, 38 F-Map electives are available for use depending on the map output desired. The F-Map package enables a user to specify the precise form of the printed output. The most important specifications include the size of the map, the number of value class intervals, the range of values and a general labeling of each map. In this study output contour maps were 20 by 30 inches and then reduced to page size. Various levels of density were specified for each map. These levels and the range of each level appear in the legend accompanying each map.

[11] Dougenik and Sheehan, Part II, pp. 26-56.

ANALYSIS

Father ancestry and education was analyzed regarding Indian blood level and educational characteristics. The principal purpose of this analysis was to demonstrate the feasibility and ease with which one may determine both the location and characteristics of a potential client population in delivering educational programs.

To this end, the greatest range in variation of each variable is described in relation to overall consistency of pattern. Additional attention is given to both intermediate range of variability in relation to examples depicting inconsistencies and potential abnormalities. By so doing, tribal educational program planners may anticipate and prepare for contingencies normally not considered such as: (1) isolated clusters of families needing remedial education found in areas of generally high affluence and education, and (2) a high degree of socio-economic segregation of Indian families, with children of minimally-educated fathers concentrated in certain areas of the tribal jurisdiction.

SYMAPs of the Distribution of Creek Fathers by Cultural (Blood-Level)

Figure 2 is a SYMAP depicting the Indian blood level of Creek fathers surveyed living in the southern region of the Creek Nation. It is visibly clear that the majority of Creek fathers residing in this area had a claimed Indian blood level of 6/8 to 8/8.

These men resided primarily in rural areas and in small population centers, and clustered near the periphery of the larger urban communities in the region such as Holdenville, Okemah, and Okmulgee. Creek fathers with an Indian blood level of 3/8 to 5/8 appear to reside in "bands" or buffers contiguous to those with an Indian blood level of 5/8 to 8/8.

Creek fathers with an Indian blood level of 2/8 reside in small concentrations on the periphery of small urban communities. Men with 0 to 1/8 Indian blood levels appear in larger concentrations than those with 2/8 Indian blood levels. They are also located in or near small communities and radiate from those communities into portions of the rural southern region.

The Indian blood level of Creek fathers living in the northern region of the Creek Nation is illustrated in Figure 3. Within this region, those with an Indian blood level of 6/8 to 8/8 are highly concentrated in the western quadrant. This is primarily a rural area with several small communities. These individuals reside in or near to the larger urban areas of Tulsa and Muskogee in the eastern section.

Creek fathers with an Indian blood level of 3/8 to 5/8 are found to reside contiguous to the larger concentrations of Creek fathers with an Indian blood level of 6/8 to 8/8. The small concentrations of fathers with Indian blood levels of 0 to 1/8 and 2/8 are located in rural areas and close to small urban areas.

The greatest range of variation in distribution relative to Indian fathers (Figures 2 and 3) appears to be between individuals at the lower end of the Indian blood level range. Creek fathers whose blood quantum is 1/8 to 2/8 appear to be concentrated primarily on the northern and western fringes of the Creek Nation. A major concentration is found from the intersection of I-40 and Turnpike West, in and around the communities of Henryetta, Okemah, Boley and Wetumka, Oklahoma (See also Figure 1). This variation also holds true for Creek fathers claiming 3/8 to 5/8 Indian blood.

The most consistently observed pattern of distribution is found in small areas of the southern region (Figure 2) with individuals claiming an Indian blood level of 6/8 to 8/8. In both instances their distribution is widespread. Densities appear to increase outwardly from small population centers.

The northern region's (Figure 3) distribution characteristics of three-quarter to full-blood Creek fathers tends to significantly differ from those in the south. Creek fathers whose Indian blood level tends to be high are found primarily in the northwest quadrant from Bristow to north of the Arkansas River. Secondary concentrations can be observed in the southeast, centered primarily on the city of Muskogee, Oklahoma.

The significance of these observable patterns lies primarily in their use in determining the focus of educational programming. If tribal planners are going to focus tribal resources and policy of these members closest to Indian culture (i.e., one-half to full-bloods), then large urban centers such as Tulsa should not be considered as principal service delivery points for educational programming. As indicated in Figures 2 and 3, two distinct distribution patterns emerge:

1. Fathers with relatively low Indian blood levels (less than one-half) tend to be concentrated in the northern, more urbanized region in and around Tulsa and Muskogee, Oklahoma; and

2. Those with relatively high Indian blood levels (greater than one-half) tend to be concentrated in the southern, primarily rural region in and around small communities such as Boley, Wetumka, and Okemah, Oklahoma.

Creek fathers with an educational level of 10 years or less are widely apportioned throughout the rural areas of the northern region. Men with 11 to 12 years of education appear to also be located in rural areas; however, they are also located closer to population centers.

Individuals with post high school educations are concentrated primarily in population centers. This is true of those with 15 years or more of education also. They reside in small pockets in close proximity, or within large population centers such as Tulsa, Oklahoma.

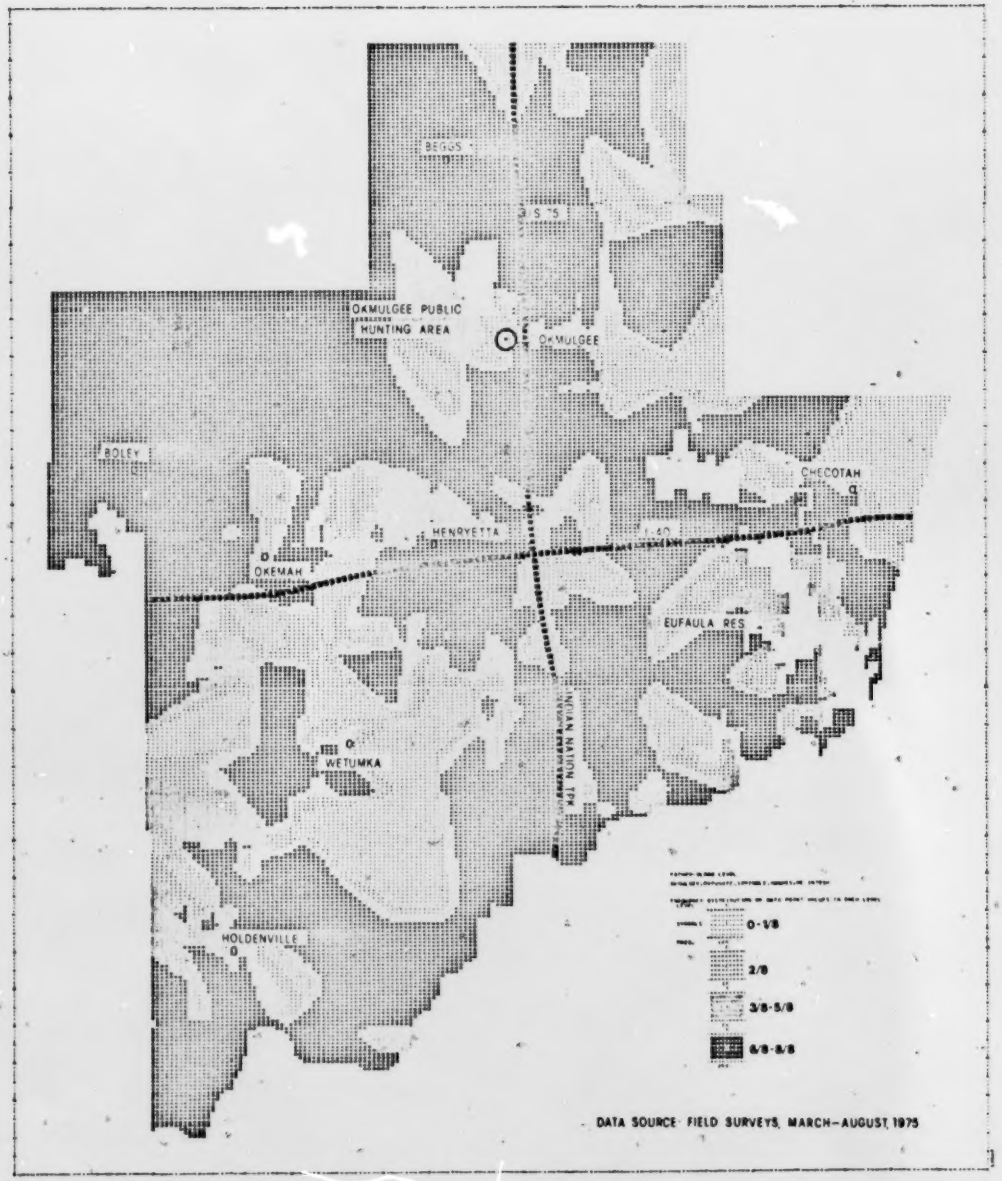

Figure 2. Father Blood Level--Southern Region.

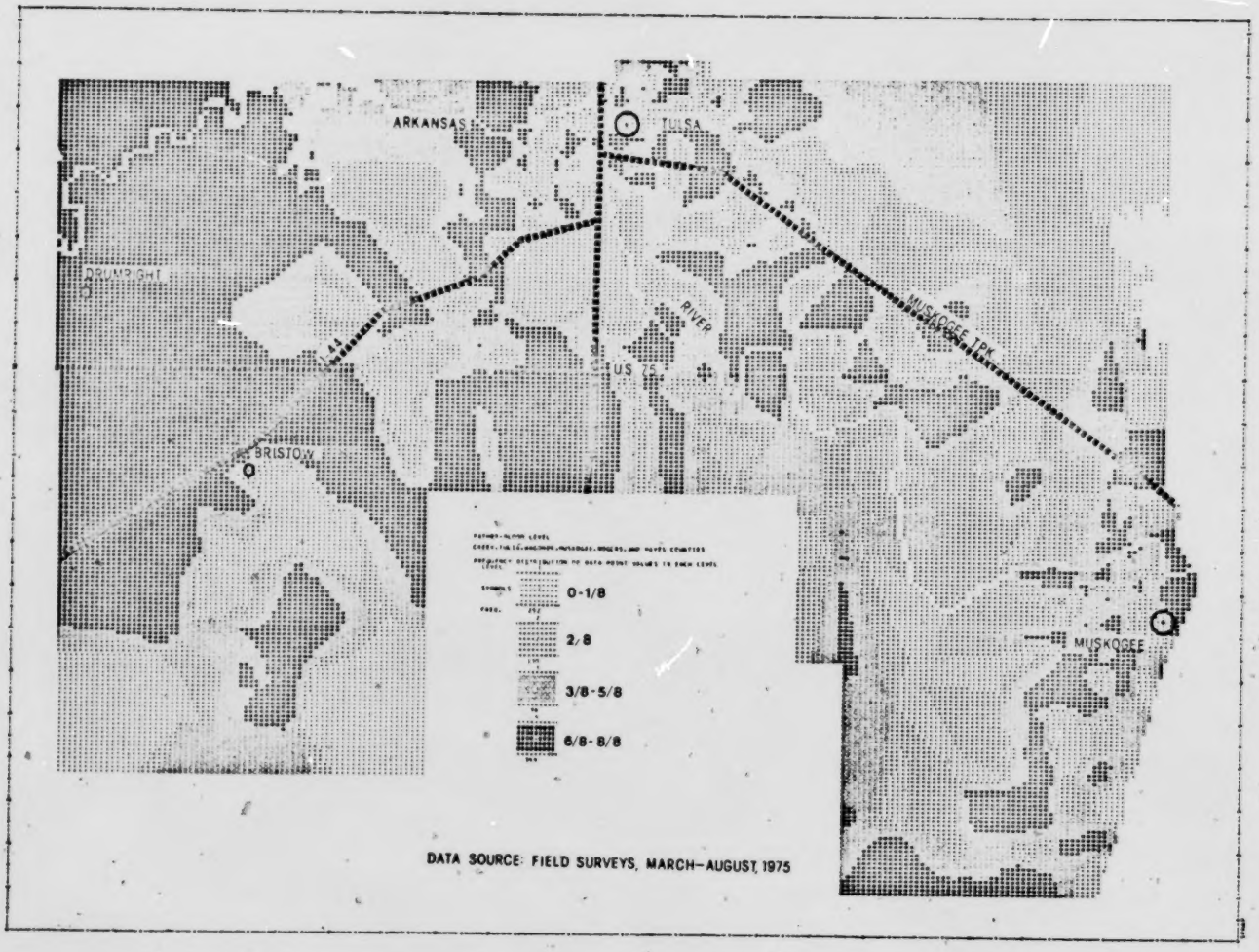

Figure 3. Father Blood Level--Northern Region

SYMAPs of the Distribution of Creek Fathers by Educational Level

By far the most extensive and heaviest concentration of Creek fathers achieving at least some post-secondary education are found in the norther region of the Creek Nation. The greatest range in variation (extensiveness of distribution) is found in the southern region for Creek fathers achieving less than a high school education but greater than 10 years (Figure 4).

For those individuals achieving less than a high school education, their major location characteristic seems to be rural, away from major population centers and area arterials. This suggests that in the more isolated areas of the region are concentrated the most significant clusters of less educated individuals.

Conversely, major clusters of Creek fathers who have achieved from one to two years or more of post-secondary education tend to be located near major population centers in both the northern and southern regions of the Creek Nation (Figures 4 and 5). An exception to this pattern is found in the southern region south and west of Okemah. Here a major concentration is found who have achieved an excess of three years of post-secondary education; but who are not located near a major urban center nor a small rural community. Perhaps this concentration of relatively well educated individuals is due in part to its proximity and accessibility to East Central State University (Ada, Oklahoma) and Seminole Junior College. This relationship suggests that as one moves closer to urban centers, the greater the concentration of more well educated Creek parents.

As was seen also in Figure 4, fathers with an educational level of kindergarten through 10 years comprise the largest category in this region. These men are widely apportioned through this primarily rural area.

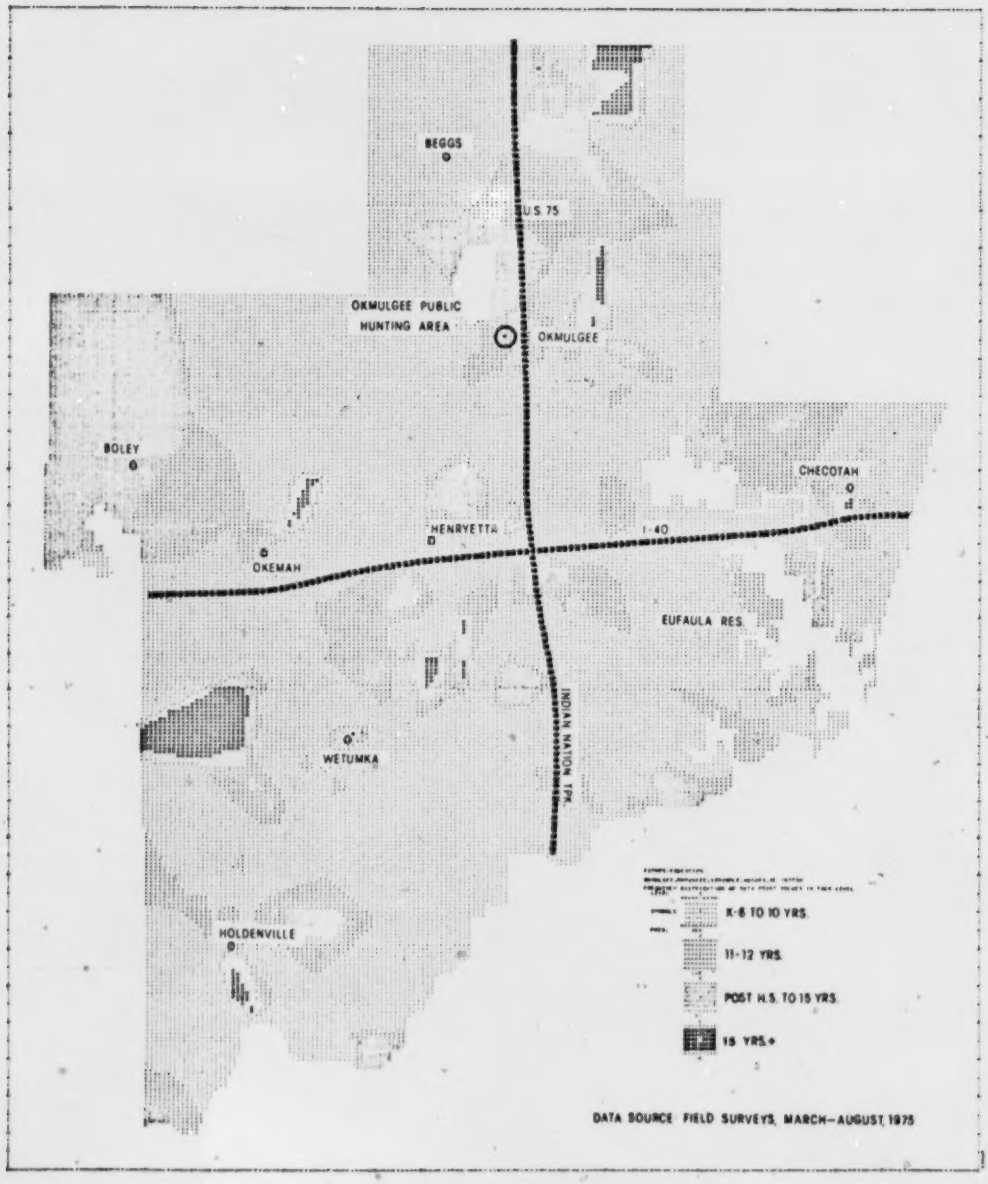

Figure 4. Father Educational Level--Southern Region.

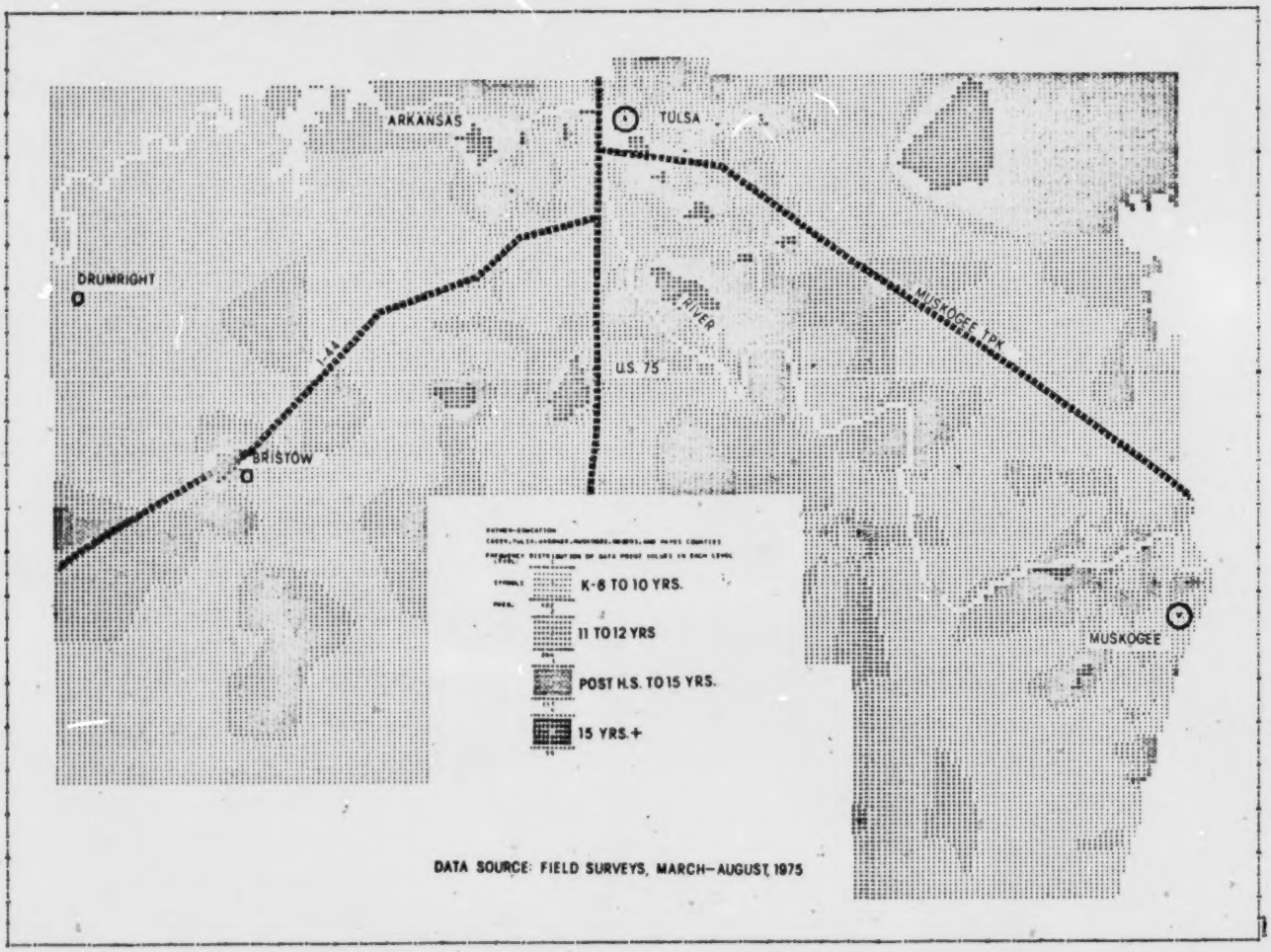

Figure 5. Father Educational Level--Northern Region

The other educational level categories are highly concentrated in close proximity to population centers. While those achieving 11 to 12 years of education are less prevalent than those with less education, they are scattered throughout the region. This is not true of those achieving more than a high school education. These individuals are quite distinctly located in the metropolitan areas of Tulsa, Wetumka, Holdenville, and Okmulgee.

SPSS Sample Analysis

As shown in the Chi-square analysis (Tables I and II), a marked discrepancy is revealed for full blood Creek fathers in their educational attainment at the high school and college level. Through closer inspection of the low educational attainment of full blood Creek parents, through computer mapping, one can isolate those geographic regions wherein the full bloods with low educational attainment reside. The geographic origin of these individuals appears to be rural areas of the southern region. The implications of combing SPSS (Tables I and II) and SYMAP results in creating a methodology whereby tribal planners can pinpoint, quantitatively and geographically, areas of greatest educational need.

TABLE I

SPSS SAMPLE OUTPUT--EDUCATIONAL LEVEL OF FATHER BY
INDIAN ANCESTRY OR BLOOD LEVEL

(1) COUNT (2) ROW PCT (3) COL PCT (4) TOT PCT Education		Indian Blood Level									
		0	1/8	2/8 or 1/4	3/8	4/8 or 1/2	5/8	6/8 or 3/4	7/8	8/8 or 4/4	Row Total
K-66 years	(1)	17	2	5	1	6	3	4	5	101	144
	(2)	11.8%	1.4%	3.5%	0.7%	4.2%	2.1%	2.8%	3.5%	70.1%	16.1%
	(3)	13.0%	6.1%	12.2%	9.1%	8.8%	21.4%	9.5%	22.7%	19.0%	
	(4)	1.9%	0.2%	0.6%	0.1%	0.7%	0.3%	0.4%	0.6%	11.3%	
7-9 years	(1)	23	7	12	1	9	1	4	1	107	165
	(2)	13.9%	4.2%	7.3%	0.6%	5.5%	0.6%	2.4%	0.6%	64.8%	18.5%
	(3)	17.6%	21.2%	29.3%	9.1%	13.2%	7.1%	9.5%	4.5%	20.1%	
	(4)	2.6%	0.8%	1.3%	0.1%	1.0%	0.1%	0.4%	0.1%	12.0%	
10 years	(1)	9	1	3	0	4	2	1	0	43	63
	(2)	14.3%	1.6%	4.8%	0.0%	6.3%	3.2%	1.6%	0.0%	68.3%	7.0%
	(3)	6.9%	3.0%	7.3%	0.0%	5.9%	14.3%	2.4%	0.0%	8.1%	
	(4)	1.0%	0.1%	0.3%	0.0%	0.4%	0.2%	0.1%	0.0%	4.8%	
11 years	(1)	8	4	6	1	4	0	2	0	42	67
	(2)	11.9%	6.0%	9.0%	1.5%	6.0%	0.0%	3.0%	0.0%	62.7%	7.5%
	(3)	6.1%	12.1%	14.6%	9.1%	5.9%	0.0%	4.8%	0.0%	7.9%	
	(4)	0.9%	0.4%	0.7%	0.1%	0.4%	0.0%	0.2%	0.0%	4.7%	

TABLE I (Continued)

(1) COUNT (2) ROW PCT (3) COL PCT (4) TOT PCT Education		Indian Blood Level									
		0	1/8	2/8 or 1/4	3/8	4/8 or 1/2	5/8	6/8 or 3/4	7/8	8/8 or 4/4	Row Total
12 years	(1)	47	14	6	6	24	2	12	7	140	258
	(2)	18.2%	5.4%	2.3	2.3%	9.3%	0.8%	4.7%	2.7%	54.3%	28.9%
	(3)	35.9%	42.4%	14.6%	54.5%	35.3%	14.3%	28.6%	31.8%	26.3%	
	(4)	5.3%	1.6%	0.7%	0.7%	2.7%	0.2%	1.3%	0.8%	15.7%	
post H.S.	(1)	8	2	4	0	4	0	0	0	22	40
1 year	(2)	20.0%	5.0%	10.0%	0.0%	10.0%	0.0%	0.0%	0.0%	55.0%	4.5%
	(3)	6.1%	6.1%	9.8%	0.0%	5.9%	0.0%	0.0%	0.0%	4.1%	
	(4)	0.9%	0.2%	0.4%	0.0%	0.4%	0.0%	0.0%	0.0%	2.5%	
14 years	(1)	11	0	2	0	7	2	14	4	34	74
	(2)	14.9%	0.0%	2.7%	0.0%	9.5%	2.7%	18.9%	5.4%	45.9%	8.3%
	(3)	8.4%	0.0%	4.9%	0.0%	10.3%	14.3%	13.3%	18.2%	6.4%	
	(4)	1.2%	0.0%	0.2%	0.0%	0.8%	0.2%	1.6%	0.4%	3.8%	
15 years	(1)	1	0	1	0	3	1	2	1		27
	(2)	3.7%	0.0%	3.7%	0.0%	11.1%	3.7%	7.4%	3.7%	66.7%	3.0%
	(3)	0.8%	0.0%	2.4%	0.0%	4.4%	7.1%	4.8%	4.5%	3.4%	
	(4)	0.1%	0.0%	0.1%	0.0%	0.3%	0.1%	0.2%	0.1%	2.0%	
16 years	(1)	5	2	1	0	4	1	4	3	11	27
	(2)	18.5%	7.4%	3.7%	0.0%	14.8%	3.7%	0.0%	11.1%	40.7%	3.0%
	(3)	3.8%	6.1%	2.4%	0.0%	5.9%	7.1%	0.0%	13.6%	2.1%	
	(4)	0.6%	0.2%	0.1%	0.0%	0.4%	0.1%	0.0%	0.3%	1.2%	

TABLE I (Continued)

(1) COUNT (2) ROW PCT (3) COL PCT (4) TOT PCT Education		Indian Blood Level									Row Total
		0	1/8	2/8 or 1/4	3/8	4/8 or 1/2	5/8	6/8 or 3/4	7/8	8/8 or 4/4	
17-18 years	(1)	0	0	0	1	3	2	1	1	1	9
	(2)	0.0%	0.0%	0.0%	11.1%	33.3%	22.2%	11.1%	11.1%	11.1%	1.0%
	(3)	0.0%	0.0%	0.0%	9.1%	4.4%	14.3%	2.4%	4.5%	0.2%	
	(4)	0.0%	0.0%	0.0%	0.1%	0.3%	0.2%	0.1%	0.1%	0.1%	
Over 18 years	(1)	1	1	1	0	0	0	1	0	2	6
	(2)	16.7%	16.7%	16.7%	0.0%	0.0%	0.0%	16.7%	0.0%	33.3%	0.7%
	(3)	0.8%	3.0%	2.4%	0.0%	0.0%	0.0%	2.4%	0.0%	0.4%	
	(4)	0.1%	0.1%	0.1%	0.0%	0.0%	0.0%	0.1%	0.0%	0.2%	
No response	(1)	1	0	0	1	0	0	1	0	11	14
	(2)	7.1%	0.0%	0.0%	7.1%	0.0%	0.0%	7.1%	0.0%	78.6%	1.6%
	(3)	0.8%	0.0%	0.0%	9.1%	0.0%	0.0%	2.4%	0.0%	2.1%	
	(4)	0.1%	0.0%	0.0%	0.1%	0.0%	0.0%	0.1%	0.0%	1.2%	
Column Total		131 14.7%	33 3.7%	41 4.6%	11 1.2%	68 7.6%	14 1.6%	42 4.7%	22 2.5%	532 59.5%	894 100.0%

Number of missing observations = 0

Source: Field Survey, Creek Nation, March-August, 1975.

TABLE II

CELL DESCRIPTION OF CHI-SQUARE ANALYSIS OF
EDUCATIONAL AND INDIAN ANCESTRY OR
BLOOD LEVEL OF FATHER

Education	Cell (Table V)	Blood Level	Observed Value	Expected Value	Observed-Expected	$O-E^2$	Chi-Square Value
K-6 years	a	0	17	21.27	-4.27	18.23	.86
	b	1/8-1/4	7	12.11	-5.11	26.11	2.16
	c	3/8-1/2	7	12.76	-5.76	33.12	2.60
	d	5/8-8/8	113	97.85	15.15	229.52	2.34
7-9 years	e	0	23	24.38	-1.38	1.90	.08
	f	1/8-1/4	19	13.88	5.12	26.21	1.89
	g	3/8-1/2	10	14.63	-4.63	21.44	1.47
	h	5/8-8/8	113	112.13	.87	.76	.01
10-11 years	i	0	17	19.20	-2.20	4.84	.25
	j	1/8-1/4	14	10.93	3.07	9.42	.86
	k	3/8-1/2	9	11.52	-2.52	6.35	.55
	l	5/8-8/8	90	88.34	1.66	2.76	.03

TABLE II (Continued)

Education	Cell (Table V)	Blood Level	Observed Value	Expected Value	Observed-Expected	$O-E^2$	Chi-Square Value
12 years	m	0	47	38.11	8.89	79.03	2.07
	n	1/8-1/4	20	21.70	-1.70	2.89	.13
	o	3/8-1/2	30	22.87	7.13	50.84	2.22
	p	5/8-8/8	161	175.32	-14.32	205.06	1.17
Post secondary	q	0	26	27.03	-1.03	1.06	.04
	r	1/8-1/4	14	15.39	-1.39	1.93	.13
	s	3/8-1/2	22	16.22	5.78	33.41	2.06
	t	5/8-8/8	121	124.36	-3.36	11.29	.09

$X^2 = 21.02$; df = 12; p - .050.

CONCLUSIONS

By identifying educational problems using frequency distribution, Chi-square, and computer maps the feasibility of combining SPSS and SYMAP in developing an efficient and accurate educational planning and information system has been demonstrated. By the combined application of both a statistical and cartographical methodology, visual phrases are created which simply convey rather complicated research information concerning tribal educational characteristics.

Through the development and utilization of a Tribal Educational Planning and Information System (TEPIS), tribal planning staffs can more effectively cope with performing such functions as: coordination of educational projects to insure that they are developed, implemented, and brought to completion; statistically and visually monitoring of educational programs and comparing what is happening with what was supposed to happen; analysis and evaluation of the impact of educational projects to determine what happened, to whom and how well it happened; on-going planning of educational programs; administration of the foregoing to insure that coordination, monitoring, evaluation, on-going planning and administration itself effectively take place through the tribal staff. All of the actions resulting from these educational planning functions (expand, re-direct, know, recognize, decide, etc.) can be facilitated by reliable information produced by a statistical and visual tribal information system.

TEPIS provides the basic ingredients that would assist these functions to take place over time: a set of examples that, through their application to other socio-economic variables should assist tribal staffs in identifying the educationsl and demographic information it needs to establish geographical

areas of priority. With computer facilities available through each state's university extension system, TEPIS will assist tribal staffs in collecting, storing, processing and reporting this information on an on-going, established routine basis.

TEPIS provides accurate statistical and cartographical information upon which can be based sound decisions and should increase the potential for sound tribal management decision because:

1. It could be based on data pools already existing in the public domain such as census reports, governmental agency statistics and so forth; or on survey generated demographic information collected by tribal staff;

2. It could provide visual information on tribal target populations socio-economic characteristics in the form of simple, easy to understand maps;

3. It could provide data for comparative analysis of needs and tribal service utilization for Indian people;

4. It could visually and statistically monitor changes in the general socio-demographic, economic and sociological changes within the tribal jurisdiction;

5. It can provide both statistical and cartographical data for program development and documentation for external funding;

6. It presents information in a useful form.

One may conclude that Creek Nation tribal educational problems have a distinctive geographical component, and that the incidence of Indian educational achievement can be subject to extreme geographical and social variation. Also apparent is the need of tribal planners to correct areal or regional educational discrimination or inequality by focusing on areas evidencing the greatest educational need.

The lack of adequate information and planning methodologies on statistical and geographical variations on Indian education within tribal jurisdictions has been pointed out. Tribal administrators have been able to give little attention to geographical variations in educational achievement, as a result

of a lack of reliable and understandable information. With application of TEPIS these conditions could change. Tribal planners in analyzing TEPIS cartographical and statistical output could become more aware, hopefully communicating this awareness to elected tribal officials.

The position taken here is that computer based statistical and cartographical methodologies can be combined to facilitate analysis of tribal demographic and educational characteristics, thus enhancing better decisions regarding educational program delivery and accessibility. TEPIS informational output could also assist tribal officials to convey critical educational data to their client population, thus helping to sensitize Indian people to the magnitude of quantitative inequities in education within Indian society.

TEPIS can recognize those individuals who are the most educationally disadvantaged but at the same time closest to Indian culture. In this way an information system has been developed which provides usable and effective educational planning information in developing better tribal services to the educationally disadvantaged within the tribe.

TEPIS is an accurate education planning tool that is easily understood and implemented by tribal staff members. It is a versatile system, capable of serving both the needs of the tribal planner and the program evaluator. By analysis of parental ethnic characteristics and education, TEPIS proves it can produce data that are cartographically and statistically valid. Hence, it is able to meet the needs of tribal staff charged with the development of an effective, least-cost-restrictive, user-accepted tribal education system.

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APPENDIX A

CREEK NATION CENSUS SURVEY INSTRUMENT

WITH CODING LISTS

CREEK NATION CENSUS SURVEY

County _____

Township _____

Range _____

Section _____

Variable 1. HOUSEHOLD INCOME PATTERN: (Circle)

01. $ 500 - $ 1,000
02. 1,000 - 2,000
03. 2,001 - 3,000
04. 3,001 - 6,000
05. 6,001 - 10,000
06. 10,001 - 15,000
07. Over 15,000

Variable 2. RESIDENCE STATUS: (Circle)

01. Urban (Greater than 2,500)
02. Rural

Variable 3. HOUSING STATUS: (Circle)

01. Own fully (Just one owner)
02. Own partially (More than one owner)
03. Rent
04. Other (please explain) _____

Variable 4. If house is owned, how is it financed? (Circle)

01. Financed by Creek Nation Housing Authority
02. Financed by Home Improvement Program (HIP)
03. Financed by Farmers Home Administration (FHA)
04. Financed by Other Federal Assistance
05. Financed by Private Funding
06. None of the above

Variable 5. If renting, who is your landlord? (Circle)

01. Private individual or corporation
02. Creek Nation Housing Authority
03. Other Federal programs
04. None of the above

Variable 6. Is this house on restricted land? (Circle)

01. Yes
02. No

Variable 7. The present dwelling contains how many rooms? (Circle)

01. One
02. Two
03. Three
04. Four
05. Five
06. Six
07. More than six

Variable 8. What type of heating fuel is used at the present address? (Circle)

01. Natural gas
02. Electric
03. Wood/Coal
04. LPG (Propane)
05. Other

Variable 9. Where is the bathroom located? (Circle)

01. Inside
02. Outside

Variable 10. What is the water source for the present address? (Circle)

01. Well
02. Rural water line
03. City water
04. Pond

Variable 11. If well water is used, is it pumped into the house? (Circle)

01. Yes
02. No
03. Does not apply

Variable 12. How long has this family lived at this address? (Circle)

01. 1-12 months
02. 1-2 years
03. 2-4 years
04. 4-10 years
05. Over 10 years

Variable 13. Are there people currently living at this address who are not regular household members? (Circle)

01. Yes
02. No

Variable 14. If there are people currently living at this address who are not regular household members, how many? (Circle)

01. One
02. Two
03. Three
04. Four
05. Five or more
06. Does not apply

Variable 15. Is the tribal language used in the immediate family? (Circle)

01. Always
02. Frequently
03. Occasionally
04. Seldom
05. Never

Variable 16. How many household members are registered voters? (Circle)

01. None
02. One
03. Two
04. Three
05. Four
06. Five
07. More than five

Variable 17. How often does this household use Indian Health Services? (Circle)

01. Always
02. Frequently
03. Occasionally
04. Seldom
05. Never

Variable 18. This household was used Indian Health Services within the last: (Circle)

01. One year
02. Two years
03. Five years
04. Ten years
05. Does not apply

Variable 19. How often does this household use Bureau of Indian Affairs' services? (Circle)

01. Always
02. Frequently
03. Occasionally
04. Seldom
05. Never

Variable 20. This household has used Bureau of Indian Affairs' Services within the last: (Circle)

01. One year
02. Three years
03. Five years
04. Ten years
05. Does not apply

Variable 21. When at home, what one organization do you turn to most in time of emergency? (Circle)

01. Bureau of Indian Affairs
02. Creek Tribe (CHR, Manpower Representative, Education, etc.)
03. Non-Bureau of Indian Affairs' federal organization
04. Other

Variable 22. When away from home, what organization do you turn to in the time of emergency? (Circle)

01. Bureau of Indian Affairs
02. Creek Tribe (CHR, Manpower Representative, Education, etc.)
03. Non-Bureau of Indian Affairs' federal organization
04. Other

Variable 23. When at home, what one person do you turn to most in time of emergency? (Circle)

01. Relative
02. Minister
03. Tribal elder
04. Friend
05. Other

Variable 24. When at home and if you turn to a friend, is he or she: (Circle)

01. Indian
02. Non-Indian
03. Does not apply

Variable 25. When away from home what one person do you turn to most in time of emergency? (Circle)

01. Relative
02. Minister
03. Tribal elder
04. Friend
05. Other

Variable 26. When away from home and if you turn to a friend, is he or she: (Circle)

01. Indian
02. Non-Indian
03. Does not apply

HOUSEHOLD MEMBERS' (REGULARLY LIVING HERE) PERSONAL CHARACTERISTICS AND EMPLOYMENT PATTERNS

Member (See Coding List A)	Ages*	Education: No. of Years Completed (Coding List B)	Education: Highest Degree Completed (See Coding List C)	**	*** (See Coding List D)		Tribe (See Coding List E): Major A	Tribe (See Coding List E): Major B	Degree of Indian Blood (Coding List F): Major A	Degree of Indian Blood (Coding List F): Minor B	Degree of Indian Blood (Coding List F): Total C

*01 0- 5 years
02 6-12 years
03 13-18 years
04 19-25 years
05 26-35 years
06 36-50 years
07 51-65 years
08 Over 65 years

**If age of member is 6-18 years, then:
01. Still in school
02. Dropped out
03. Does not apply

***If member has more than high school education, where? (See Coding List D)

Understand Tribal Language (1=yes, 2=no)	Speak Tribal Language Fluently (1=yes, 2=no)	Tribal Town Affiliation (Coding List G)	Household Income Contribution (1=yes, 2=no)	Employment A****	Employment B*****
___	___	___	___	___	___
___	___	___	___	___	___
___	___	___	___	___	___
___	___	___	___	___	___
___	___	___	___	___	___
___	___	___	___	___	___
___	___	___	___	___	___
___	___	___	___	___	___

****01 Self-employed
02 Outside (work for someone else)
03 Unemployed
04 Retired
05 Does not apply

*****01 Part time (less than 40 hrs per week)
02 Full time
03 Does not apply

Occupation Skill (Coding List H)	Length of Time on Present Job or School ******	Distance to and From Work or School *******	Physical Handicap (1=yes, 2=no)
___	___	___	___
___	___	___	___
___	___	___	___
___	___	___	___
___	___	___	___
___	___	___	___
___	___	___	___
___	___	___	___

******01 1- 6 months
02 7-12 months
03 1- 2 years
04 3- 5 years
05 6-10 years
06 Over 10 years
07 Does not apply for high school age or less person

*******01 1- 5 miles
02 6- 10 miles
03 11- 20 miles
04 21- 30 miles
05 31- 50 miles
06 51-100 miles
07 Over 100 miles
08 Does not apply for high school age or less person

Coding List A

Household Members by Title

01. Father (Husband)
02. Mother (Wife)
03. Son
04. Daughter
05. Son-in-Law
06. Daughter-in-Law
07. Stepfather
08. Stepmother
09. Uncle
10. Aunt
11. Grandmother
12. Grandfather
13. Nephew
14. Niece
15. Mother-in-Law
16. Father-in-Law
17. Other (please describe) _____

Coding List B

Years of Formal Education Completed

01. K-6 grade
02. 7-9 grade
03. 10 grade
04. 11 grade
05. 12 grade (high school graduate)
06. 13 (one year of post-high school work)
07. 14 (associate degree)
08. 15
09. 16
10. 18
11. Over 18
12. Does not apply

Coding List C

Level of Formal Post-Secondary Education by Degree

01. Certificate of Completion
02. Associate Degree
03. Bachelors Degree
04. Masters Degree
05. Doctorate
06. Post-Doctorate
07. Does not apply

Coding List D

Post-Secondary Educational Institutions

01. Altus Junior College
02. Bacone College
03. Bethany Nazarene College
04. Cameron College
05. Carl Albert Junior College
06. Central State University
07. Claremore Junior College
08. Conners State College
09. East Central State College
10. Eastern Oklahoma State College
11. El Reno Junior College
12. Langston University
13. Murray State College
14. Northeastern Oklahoma A&M
15. Northeastern State College
16. Northern Oklahoma College
17. Northwestern State College
18. Oklahoma Baptist University
19. Oklahoma Christian College
20. Oklahoma City University
21. Oklahoma College of Liberal Arts
22. Oklahoma Panhandle State College
23. Oklahoma State University
24. Oral Roberts University
25. Oscar Rose Junior College
26. Phillips University
27. Saint Gregory's College
28. Sayre Junior College
29. Seminole Junior College
30. Southeastern State College
31. South Oklahoma City Junior College
32. Southwestern College
33. Southwestern State College
34. Tulsa Junior College
35. University of Oklahoma
36. Tulsa University
37. Haskell Indian Junior College
38. Chilacco, BIA
39. Out-of-State (other than Haskell)

Vo-Tech Area Schools

40. Tulsa
41. Enid
42. Oklahoma City
43. Lawton
44. Bartlesville
45. Drumright
46. Muskogee
47. Ardmore
48. Wayne
49. El Reno
50. Shawnee
51. Fort Cobb
52. Duncan
53. Burns Flat
54. McAlester
55. Poteau
56. Chickasha
57. Hugo
58. OST
59. Proprietary
60. Other
61. Does not apply

Coding List E

Indian Tribes Resident to the Creek Indian Nation

01. Creek
02. Seminole
03. Euchee
04. Chickasaw
05. Choctaw
06. Cherokee
07. Kickapoo
08. Pawnee
09. Ponca
10. Potawatomi
11. Sac and Fox
12. Osage
13. Shawnee
14. Kiowa
15. Commanche
16. Seneca
17. Delaware
18. Cayuga
19. Shoshoni
20. Quapaw
21. Sioux
22. Chippewa
23. Navajo
24. Winnebago
25. Hopi
26. Pueblo
27. Other _____
28. None

Coding List F

Degree of Indian Blood Quantum

01. 0
02. 1/8
03. 2/8 or 1/4
04. 3/8
05. 4/8 or 1/2
06. 5/8
07. 6/8 or 3/4
08. 7/8
09. 8/8 or 4/4

Coding List G

Tribal Towns Within Creek Indian Nation

01. Coweta
02. Broken Arrow
03. Cheyaha
04. Locharpoka
05. Conchartey
06. Hitchita
07. Cussehta
08. Taskeko
09. Tulsa (Canadian)
10. Tulsa (Little River)
11. Noyarka
12. Akfaske
13. Arbekoche
14. Arbeka
15. Arbeka 2nd
16. Greenleaf
17. Oewohka
18. Fish Pond
19. Thlopthlocco
20. Tokebachee
21. Thewahley
22. Kialiga
23. Tokpafka
24. Talmochassee
25. Eufaula 1
26. Eufaula 2
27. Pakantalahassee
28. Hillabee
29. Chartarksofka
30. Kichopatake
31. Arthussee
32. Tallahossochee
33. Allabamma
34. Osochee
35. Oeokofke
36. Okcharye
37. Ocheyapofa
38. Talwathakko
39. Talartega
40. Hutschechapa
41. Quassartey--1
42. Quassartey--2
43. Yoochee
44. Big Spring
45. Don't know
46. None

Coding List H

Occupational Skill Listing

01. Industrial Production
(Foundry workers - machinists - printers - assemblers - welders)

02. Office Occupations
(Clerks - accountants - lawyers - administrators - secretary)

03. Service Occupations
(Building custodian - cooks and chefs - waitresses - barber - policeman - mail carriers)

04. Educational Occupations
(Teachers - librarians - teacher's aide - community worker)

05. Sales Occupations
(Automotive sales - insurance agents - service station attendants)

06. Construction Occupations
(Bricklayers - carpenters - electricians - painters - roofers - plumbers)

07. Occupations in Transportation Activities
(Air Traffic controllers - railroad brakeman - truck or taxi driver)

08. Scientific and Technical Occupations
(Foresters - engineers - chemists - draftsmen)

09. Mechanics and Repairmen
(Telephone serviceman - automobile repairman - TV and radio repairmen - diesel mechanic - air conditioning repairman)

10. Health Occupations
(Dentist - physician - nurse - speech pathologist - community worker)

11. Social Scientists
(Anthropologists - historians - sociologists)

12. Social Science Occupations
(School counselor - clergyman - social worker)

13. Occupations in Art and Design
(Artist - designer - architect)

14. Disabled

15. Does not apply